



Nonmonotonic Reasoning

Winter Semester 2017/18

Exercise Sheet 8 – Circumscription, inference relations

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Exercise 8.1 Define $\varphi[p_1/\psi_1, \dots, p_n/\pi_n]$, the simultaneous substitution of the predicates in p_i by the predicate expressions ψ_i in φ .

Exercise 8.2 Consider the circumscription schema for *isBlock* and the given formula

$$isBlock(a) \wedge isBlock(b).$$

Explain what happens when ...

- (a) ... the predicate expression $\psi(X) \equiv X = a$ is used.
- (b) ... the predicate expression $\psi(X) \equiv (X = a \vee X = b \vee X = c)$ is used.¹
- (c) ... *isBlock(c)* is added to the given knowledge.

Exercise 8.3 The property *Reciprocity* holds for an inference operation C iff:

$$M \subseteq C(N) \text{ and } N \subseteq C(M) \text{ implies } C(M) = C(N).$$

Prove or refute the following claim: Let C be an inference operation that satisfies Inclusion. Then C satisfies Cumulativity iff C satisfies Reciprocity.

¹An earlier version of the exercise sheet had \wedge instead of \vee , unfortunately.